REMARKS

Careful consideration has been given by the applicant to the Examiner's comments and rejection of the claims, as set forth in the outstanding Office Action, and favorable reconsideration and allowance of the application, as amended, is earnestly solicited.

Applicant notes the Examiner's rejection of Claims 1-9 under 35 U.S.C. §112, second paragraph, as being indefinite, as detailed with regard to the terminology in pending Claim 1.

Accordingly, the present Amendment which incorporates revisions implemented to the claims have taken careful cognizance of this formal ground of rejection, and appropriate terminology has been incorporated to eliminate the particular informalities questioned by the Examiner.

Applicant further notes the rejection of Claim 1 under 35 U.S.C. §103(a) as being unpatentable over Perstnev, et al. in view of Baars, et al. further in view of Burdisso, et al. and also based on Purdy.

Furthermore, Claims 2-5 have been rejected as being unpatentable over the art applied to Claim 1, further in view of Meier and Tomell, et al., whereas Claim 6 has been rejected over the art applied to Claim 1, in view of further aspects as set forth in Baars, et al.; Claim 7 has been rejected as being unpatentable over the art applied to Claim 1, further in view of Nishikawa, et al.; and Claims 8 and 9 have been rejected as being unpatentable over the art applied to Claim 1, further in view of Bratt, et al.

Concerning the prior art, applicant notes that the Examiner has extensively discussed the various publications in the Office Action. However, upon careful consideration of the art, applicant respectfully submits that the claims, as amended herein, clearly and patentably distinguish thereover, irrespective as to whether the cited publications are considered singly or in combination.

General comments pertaining to Claim 1

In the case of a hydraulic pump, a pressure medium flows from the working line over the pressure compensation line into the further cylindrical opening, as disclosed on Page 7, second paragraph of the present specification. This clearly illustrates that the principle employed for a reduction of generated noise is different from Perstnev, et al. Hereby, Claim 1 has been amended by adding the feature that at the moment at which the first end in the switchover region comes into contact with a further cylindrical opening, the cylindrical opening has no direct contact with the outlet-side kidney shaped control port. This is clearly shown in Figs. 2 and 3, and as described in full context on Page 7, second paragraph, or Page 8, last paragraph, because at the moment at which the cylindrical opening comes into contact with the first end of the pressure compensation line, it cannot be in contact with the outlet-side control port, which is located ahead of the first end of the compensation line in the direction of rotation. The formulation "the second end of the pressure compensation line is at a maximum" has been amended to read "a pressure maximum prevails at the second end of the pressure compensation line" (Claim 1; as disclosed on Page 6, line 26 – Page 7, line 2) to overcome the objections as to clarity in terminology. The word "pressure maximum" is disclosed on Page 7, line 10, with amendments being emphasized in the amended Claim 1, as presented herein.

Argumentation support of the distinctions over the cited art

Concerning the prior art, and particularly, Perstnev, et al., U.S. Patent No. 6,024,541, which is the primary reference of record, applicant further submits the following arguments in traverse thereof, particularly as set forth in the amended claims as presented herein:

Perstnev, et al., U.S. Patent No. 6,024,541, discloses an axial piston machine with a cylindrical block 26 including cylinders C1 and C2, pistons P1 and P2, and a port plate 30. The port plate 30 includes an arcuate suction slot S and an arcuate discharge slot D, while between the two slots S and D, there are provided bridge-over portions SD and DS. It is well-known in the art that when a piston compresses hydraulic liquid during passing over the bridge portion SD and reaches the discharge slot D, that this creates a pressure maximum due to the sudden pressure-rise. Therefore, it is a common practice in the state of the art to partially relieve the pressure shortly before the start of the full discharge stage (Col. 1, lines 16-18), e.g., by slowly connecting the cylinder with the discharge slot D by provision of a groove. Perstnev, et al. improves this method by incorporating a by-pass between the bridging portion SD and the discharge slot D (through a first passage 42, a cushioning chamber 44 and a further passage; Col. 2, lines 30-36). Thus, Perstnev, et al. as well "employs the idea to partly break or relieve the high pressure of the discharge stroke" (Col. 2, lines 26-29) by using a by-pass preceding the full discharge through slot D. The behavior of the by-pass, which, in the illustrated example, has three passages 42, 46 and 50, and two cushioning chambers 44 and 48, is regulated by the length of the passages d1<d2<=d3 (d1: length of 42, d2: length of 46, d3: length of 50) (Col. 2, line 50) and by the ratio of the volumes of the cushioning chambers 44 and 48 (Col. 2, line 58). Reverting to the concept in Perstnev, et al., the pressure wave is reduced already at the formation at the pressure wave by increasing the pressure in the discharge slot D slowly over the tortuous by-pass and the cushioning chambers and by preventing any sudden discharge of the highly compressed hydraulic liquid of the cylinder when it comes into contact with the discharge slot D. Thus, hydraulic liquid is transferred from the cylinder through the by-pass into the discharge slot D (Fig. 7) at a time shortly prior to the cylinder coming into contact with the discharge slot D, whereby the reduction in the noise is due to a regular silencer that also combines a sequence of volumes.

Any effect in a correlation of the phase of propagating pressure waves is not mentioned in the prior art.

Concerning the foregoing, applicant submits the following additional technical comments pertaining to the prior art, as particularly represented by Perstnev, et al.:

The present application, to the contrary, claims a pressure compensation line for connecting the working line 27, not the discharge slot D, with switchover region 30 or 31 (in the case of Perstnev, the bridging portion SD). The distance L between the control port 9 (in the case of Perstnev, the discharge slot D) and the second end 34 of the pressure compensation line 33 is dimensioned such that pressure maximum of the advancing pressure wave in the working line 27 passes the second end 34 of the pressure compensation line 33 at the moment, the first end 32 of the pressure compensation line 33 and, thus, even with the working line 27 at the second end 34 of the compensation line 33, at which hydraulic liquid is transferred from the working line 27 back to the cylinder 35.1 and pressure is relieved from the working line 27, when the pressure maximum passes the second end 34. A completely different concept of reducing the pressure wave is claimed in the present application. Thus, after the pressure wave has already been formed, at a point in time and space when the advancing pressure wave is at a pressure maximum, pressure is relieved from the working line. Thus, a part of the energy of the propagating pressure wave is not taken out of the working line, and this represents the effect used for implementing the noise reduction.

In addition, applicant submits that Claim 1, as amended herein, distinguishes over the art, as representative by Perstnev, et al. in three (3) particular novel aspects.

A first aspect resides in that the second end of the by-pass leads into the discharge D (as set forth in the Abstract) but not into any working line, and applicant notes that a discharge D, as represented by Perstnev, et al. does not pertain to a working line.

Secondly, Perstnev, et al. neither mention any adaption of the claimed length L nor suggest the consideration of any pressure maximum or minimum of the pressure wave. Both are needed for the claimed adaption of L, as explained hereinabove. Hereby, it can even be proven that the claimed length L does not exist in Perstnev, et al., whereby L is defined and claimed as the distance between the outlet-side kidney-shaped control port 9 and the second end 34 of the pressure compensation line 33 in the working line 27. Thus, if the second end of the by-pass does not lead into the working line, but rather into the discharge slot D, the length L is not defined, since the second end of the pressure compensation line 33 in the working line 27 is not defined. Even if the discharge slot D is considered as representing a working line, the outlet-side kidney-shaped control port 9 would correspond to the arcuate discharge slot D of Perstnev, et al. and the second end 34 of the pressure compensation line 33 leading into the working line 27 would correspond to the second end of the by-pass leading into the discharge slot D. Thus, the claimed length L, defined between the outer-side kidney-shaped control port 9 and the second end 34 of the pressure compensation line 33 would always be zero, because both correspond to the discharge slot D. Consequently, in the case of the discharge slot D being considered as a working line, the length L would be zero and the present Claim 1 would differ from Perstnev, et al. in having a no-zero length L which is adapted to the dispersion of the pressure wave in the claimed manner.

Furthermore, a third aspect of the present invention also provides additional distinctions over Perstnev, et al.:

Thus, the present Claim 1 also differs from Perstnev, et al. in transferring hydraulic liquid from the point of the working line 27, where the second end 34 of the compensation line 33 leads in, to the cylinder 35.1, when the pressure maximum of the pressure wave advancing in the working line passes said point 34 of the working line, i.e., when the first end 32 comes into contact with the

cylinder 35. The transfer of liquid decreases the pressure maximum by taking hydraulic liquid from the working line at the moment when the pressure maximum passes the second end 34. In contrast therewith, Perstnev, et al. transfers hydraulic liquid from the cylinder to the discharge slot D (Fig. 7) shortly before the start of the full discharge stage (Col. 1, lines 16-18 and Col. 2, lines 25-29). Thus, contrary to the present invention, Perstnev, et al. transfers the liquid in the other direction, and at another point in time.

Furthermore, in addition to the foregoing distinctions, applicant notes that additional technological differences of a significant nature are also set forth herein, which are clearly and patentably distinct over Perstnev, et al. and any other art of record known to the applicant:

One who is skilled in the art and without the knowledge of the present invention, would not readily recognize that in order to achieve the maximum pulsation dampening effect the magnitude of the pulsation at the second end is required to be at a maximum when the rotating cylinder renders an opposing pressure available at the first end. Thus, one skilled in the art could not recognize that, because Perstnev, et al. proposes to slowly raise the pressure in the discharge slot D through the by-pass with a special design of tortuous passageways and cushioning chambers by slowly transferring hydraulic liquid through their described design in order to prevent any sudden rise in pressure when the cylinder and discharge slot D directly contact. Perstnev, et al. discloses a completely different concept for decreasing the pressure wave and, therefore, a person skilled in the art would not conceivably recognize the correlation of the pressure maximum with the second end of the pressure line, the adaption of the undefined length L and the change in the direction in transfer of the hydraulic liquid.

In view of the foregoing comments and arguments, and in view of the amendment implemented to Claim 1, the latter is deemed to be clearly and patentably distinct over the prior art cited by the Examiner.

Furthermore, even combining Perstnev, et al. with the secondary prior art publications cited therewith would not lead to the present invention, predicated upon the following significant distinctions:

Baars, et al., U.S. Patent No. 5,762,479 and Burdisso, et al., U.S. Patent No. 6,112,514, disclose both the negative interference of two tubes. Therefore, one tube branches into two tubes possessing different lengths, which are merged at a later point in the flow direction. The difference in the length of the tubes is intended to be one-half of the wavelength of the pressure pulsation, such that a negative interference reduces the amplitude of the pressure wave of the predetermined wavelength.

However, negative interferences represent a third technique employed to reduce pressure waves. On the one hand, this technique is not combinable with Perstnev, et al., which slowly increases the pressure in the discharge slot D by means of a by-pass instead of a sudden discharge directly in the discharge slot D, so as to prevent the formation of a pressure wave. On the other hand, the prior art does not show the technique of the present application adapted to be able to equalize different pressure zones, i.e., the cylinder opening and the working line at the time (when the cylindrical opening comes into contact with the first end of the compensation line) and the place (at the second end 34 of the pressure compensation line 33) when the pressure wave presents a pressure maximum or minimum. Thus, even a combination of Perstnev, et al. with Baars, et al. or Burdisso, et al. would not disclose nor suggest the present invention to one skilled in the art.

The foregoing secondary prior art, even when combined with Perstnev, et al. would not be applicable to the invention for the following further reasons:

Both documents refer to completely different fields of technology (compressor and jet engines) with a different medium compared to Perstnev, et al., air instead of hydraulic liquid. In addition, a combination of Perstnev, et al. and Baars, et al. or Burdisso would lead a person skilled in the art to raise the question, at which "tube" in Perstnev, et al. can negative interference be applied by applying additional "tube" parallel to the "chosen tube", whereby presumably one existing "tube" would be the by-pass or another "tube" would be the respective working line 16 or 14. Since the pressure wave cannot really advance in the tortuous by-pass, and the pressure wave is created in the discharge slot D, it would not be logical to apply a parallel tube to the by-pass, and it would not in any manner lead to the present invention. Applying the art of Baars, et al. or Burdisso, et al. to the working line 16 or 14 would lead to a working line, as shown in Fig. 3 of Baars, et al. or Fig. 1 in Burdisso, et al., but not to the invention. Hereby, it is respectfully submitted that the connection between the bridging region SD and the discharge slot D is not provided for by means of a tube, but rather by the kinetically transporting hydraulic liquid units in the cylindrical opening by continuously changing the pressure of transported hydraulic liquid from the suction slot S over the whole bridging portion SD to the discharge slot D. Thus, even if the branching off of the two tubes in Baars, et al. and Burdisso, et al. is referred to as "bridging region SD" and the merging of the tubes "discharge slot D", the prior art could not be applied to Perstnev, et al. because Perstnev, et al. does not show the connection and, thus, the same pressure condition at the discharge slot D and the bridging region SD, because there is no steady connection as would be present in a tube. Even if there is a (not existing) steady connection between the point of the by-pass in the bridging region SD with the discharge slot over a tube parallel to the by-pass in Perstnev, et al., the teachings of Burdisso, et al.

and Baars, et al. would be directed to adapt the length of both tubes such that the difference between them is one-half of the wavelength in order to achieve a negative interference. Thus, one skilled in the art would change all parameters changing the difference between the lengths d1, d2, d3, distance between the end of the by-pass 142 in the switching region and the discharge slot D and the distance "L" as signed in Fig. 7 in Item 6 of the Office Action. Therefore, five (5) parameters would need to be changed to achieve negative interference (if the connection between 142 and D is assumed as being a tube and the cited documents are assumed as being combined by one skilled in the art). The extensive argumentation clearly illustrates the number of theoretical steps a person skilled in the art would need in order to combine the documents of Perstnev, et al. and Baars, et al. or Burdisso, et al. in a manner to only roughly approach the present invention. Nevertheless, even such a combination would not show that hydraulic liquid flows from the working line under a pressure maximum to the cylindrical opening. Perstnev, et al. discloses hydraulic liquid flowing in the discharge slot D to slowly raise the pressure therein and Baars, et al. or Burdisso, et al. discloses hydraulic liquid flowing from the branching tubes (142 in SD) into the direction of the merging tubes (D). The reason, therefore, is that Perstnev, et al., Baars, et al. or Burdisso, et al. and the present invention show each a completely diverse and non-correlated concept or solution to reduce pressure waves, wherein the combination of two different concepts in Perstnev, et al. and Baars, et al. or Burdisso, et al. do not disclose the third concept represented by the present invention, because it is completely different from their concepts.

In summation, with regard to the further secondary publications, which are even more remote from the present invention and which only relate to secondary features of the dependent claims, inasmuch as amended Claim 1 is deemed to be clearly allowable, those particular secondary publications would not be applicable to the invention and the various subsidiary claims which are

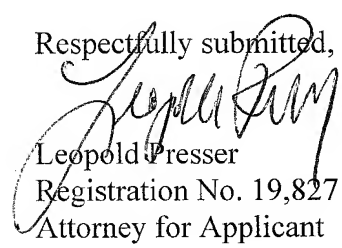
dependent from Claim 1, and which set forth further limitations which are also deemed to be directed to allowable subject matter.

In essence, the basic invention provides for a solution which provides an inventive and patentable alternative to Perstnev, et al., Baars, et al. and Burdisso, et al., even if considered with the unlikely combination of these patents, in order to reduce pressure waves and noise propagation. The present invention is readily implementable in a simple and inexpensive manner without necessitating the installation of complex additional components and structure in the inventive device, having particular reference to the designation on Page 2, second paragraph of the present specification.

Finally, predicated on basis of the foregoing comments and the amendments presented herein, the application is deemed to be in condition for allowance, and the early and favorable reconsideration by the Examiner and issuance of the Notice of Allowance is earnestly solicited.

However, in the event that the Examiner has any queries concerning the instantly submitted Amendment, applicant's attorney respectfully requests that he be accorded the courtesy of possibly a telephone conference to discuss any matters in need of attention.

Respectfully submitted,



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